REVISION 1, FINAL
OU2 IM/IRA DATA MANAGEMENT PLAN
SOIL VAPOR EXTRACTION PILOT TEST

Rocky Flats Plant

(Operable Unit No. 2)

U.S. DEPARTMENT OF ENERGY

Rocky Flats Plant
Golden, Colorado

AR

May 1994

REVISION 1, FINAL
OU2 IM/IRA DATA MANAGEMENT PLAN
SOIL VAPOR EXTRACTION PILOT TEST

Rocky Flats Plant

(Operable Unit No. 2)

U.S. DEPARTMENT OF ENERGY

Rocky Flats Plant
Golden, Colorado

May 1994

APPROVED BY:

Project Manager
Environmental Restoration

05-20-94
Date

APPROVED BY:

Department/Group Manager
Environmental Restoration

5/20/94
Date

APPROVED BY:

Quality Assurance Program Manager
Environmental Restoration

5-24-94
Date

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

1.0 INTRODUCTION

In September 1992, the Department of Energy (DOE) issued a final Subsurface Interim Measure/Interim Remedial Action (IM/IRA) plan to investigate the removal of volatile organic compound (VOC) contamination from three areas within Rocky Flats Operable Unit No.2 (OU-2). Specifically, Soil Vapor Extraction (SVE) technology would be pilot tested within, or adjacent to, suspected VOC source areas in the 903 Pad, Mound, and East Trenches.

The SVE pilot study is comprised of nine separate tests. Each test has been designed to evaluate the effectiveness of the SVE technology in different configurations and operating parameters. The SVE pilot study is described by the OU-2 IM/IRA Implementation and Operation Plan, Soil Vapor Extraction Pilot Test (DOE 1994). An overview of the SVE pilot study pilot tests is presented in Table 1-1.

The purpose of this Data Management Plan (DMP) is to identify the mechanisms and procedures for the efficient and accurate transfer of data from collection/generation of the data through its end-use. This is achieved by identifying the sources of data, establishing systematic procedures for quality control/quality assurance at each stage of data processing, creating a suitable database to allow end users the appropriate access to meet project requirements and to establish appropriate security and back-up measures to ensure data integrity. The DMP identifies and defines sample documentation, sample tracking, data entry, data proofing, data reporting, and data management personnel responsibilities.

The SVE pilot study will involve data from four different sources:

- Operations data including temperature, pressure, flowrate, etc., collected from the SVE pilot unit using an Allen Bradley data logging system and stored electronically. The Allen Bradley data logger will also collect the groundwater levels from the sandstone extraction and injection wells.

- Physical parameters collected manually including remote pressure measurements and organic vapor detector (OVD) measurements.

- Groundwater drawdown data from Hermit data loggers

TABLE 1-1

OVERVIEW OF SVE PILOT TESTS

Pilot Test No.	Purpose	Configuration	Minimum Operating Time	Week Number
1	Evaluate performance of vapor treatment system to ensure that no VOC breakthrough occurs: pressure check system; check instrumentation	AV1 open; SV1 vent closed; supply ambient air as necessary	4 hr.	1
2	Evaluate alluvium system performance	AV1 open; SV1 vent closed; supply ambient air as necessary	48 hr.	2
3	Evaluate sandstone system performance without groundwater extraction	AV1 closed; SV1 open; supply ambient air as necessary	48 hr.	2
4	Evaluate sandstone system performance with groundwater extraction	AV1 closed; SV1 open; supply ambient air as necessary	48 hr.	3
5	Evaluate interaction between alluvium and sandstone systems	AV1 open; SV1 open; supply ambient air as necessary; groundwater extraction based on results on Test 4	16 hr.	3
6-7*	Evaluate passive air inlet	Use configuration from Tests 2, and 3 or 4; opening the passive air inlets	16 hr. each	4
8-9*	Evaluate air injection	Use configuration from Tests 2, and 3 or 4; supply air injection	16 hr. each	4

*Configuration based upon earlier pilot test results

- Analytical data from off-site laboratory testing of soil, extracted soil gas collected in SUMMA canisters, and groundwater samples collected during installation, well development, and pilot testing. Data would also include waste samples and extracted groundwater samples from pilot testing. These data would be obtained from the Rocky Flats Environmental Database System (RFEDS).

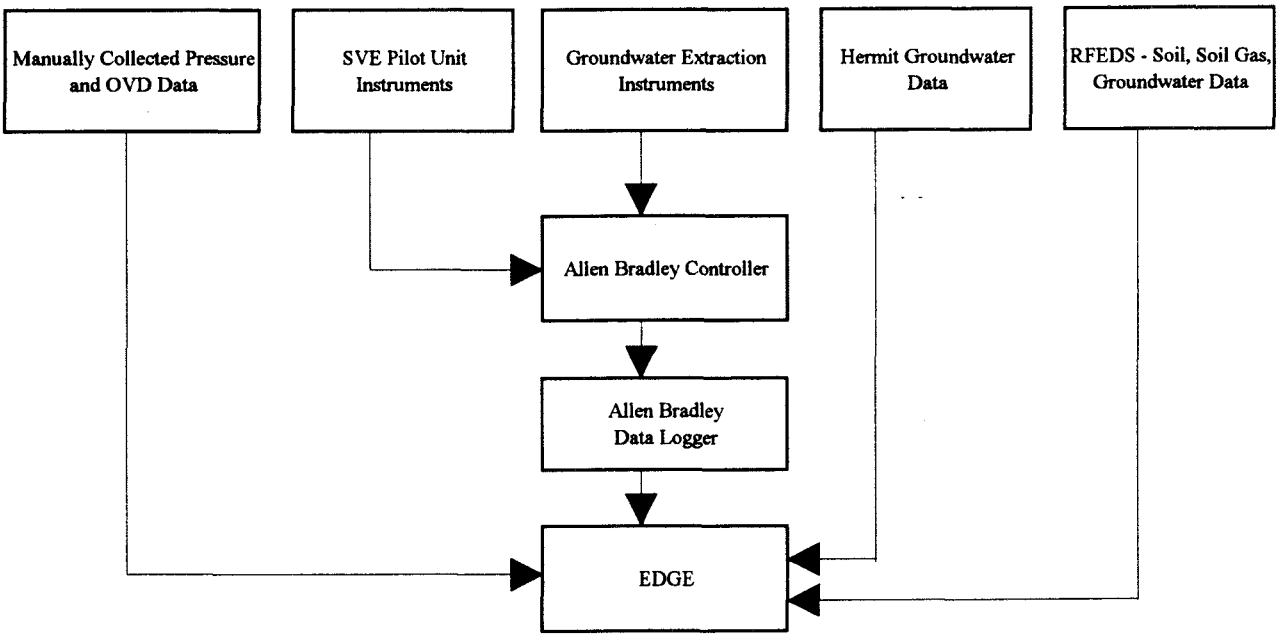
This DMP has been developed to promote the proper and complete management of scientific and technical data that will be generated from the SVE pilot study. The primary purpose of a DMP is to communicate to personnel collecting, using, and managing information how it will be recorded, stored, accessed, and reviewed. Procedures are defined and implemented to ensure that the data are collected, entered, and stored in a secure, controlled, and retrievable manner to accurately and efficiently transfer data into useful information. This plan addresses the planning, implementation, and responsibilities to optimize data management and use of the database.

This DMP focuses principally on the data management and data handling. Detailed discussion of peripheral activities (i.e., pilot test procedures, field data collection methods etc.) are described in the IOP and are not included as part of this DMP. RFEDS will be the ultimate repository for this data. However, protocol is for transferring non-analytical data have not been established. Once protocol for transferring the data have been established, the data will be placed in RFEDS.

A data management system (DMS) that includes data and sample tracking protocols and a database management program must be in place prior to initiation of field activities. Tracking and verification of data at each stage of the operation is important. The data tracking procedures identified in this DMP vary according to the data collection method employed. Figure 1-1 provides a summary of the data sources and the flow of data. Data tracking and sample acquisition will be on forms and/or simple spreadsheets created for each collection activity. Storage of the SVE pilot study data will use an environmental database, EDGE (Environmental Data Integration and Export). EDGE is designed to be used as a centralized information repository capable of handling chemical, process, and geological/geotechnical information.

FIGURE 1-1

SUMMARY OF DATA SOURCES AND DATA FLOW



2.0 RESPONSIBILITIES AND QUALIFICATIONS

Support staff for the data management tasks includes all personnel involved in data acquisition, quality control (QC) checking, and data processing. The designated staff are responsible for implementing and carrying out data management activities according to this plan. All personnel shall be qualified to perform the tasks assigned to them. Since this project is an interactive and evolving process, there will be some on-the-job training.

The primary personnel responsible for data management are the Project Manager, Project Data Manager, Database Administrator, Field Data Coordinator, and QA/QC Officer. The responsibilities for these positions are summarized in the following sections.

2.1 PROJECT MANAGER

The Project Manager will be responsible for ensuring that all data are collected, processed, and stored in a manner consistent with this DMP. Data management support personnel will report to the Project Manager any problems that may impact the integrity of the data and/or pilot test. The Project Manager will report to the EG&G Project Manager.

2.2 PROJECT DATA MANAGER

The Project Data Manager has overall responsibility for the data management program including systematic updating of data and review of the computerized DMS. This person will establish the appropriate data management protocols as summarized in this DMP, instruct Database Administrator and Field Data Coordinator in the proper procedures, and oversee the operation of the data management system. The Data Manager's responsibility includes the following:

- Implement the appropriate QA/QC procedures and document control
- Directly communicate with data management personnel concerning procedures for data transmittal and problem resolution

- Accept data from the field
- Perform completeness check of field data and the EDGE database
- Document data distributions and users of final data

The Data Manager will report directly to the Project Manager.

2.3 DATABASE ADMINISTRATOR (DBA)

The Database Administrator (DBA) will be responsible for ensuring the requisite hardware and software are in place and functional. The DBA will configure the database to accept the SVE data.

The DBA will ensure that an appropriate database management system is selected. The database management system will be designed so that data are preserved, retrievable, traceable, and available for response to regulatory agency and user requirements.

The DBA is also responsible for executing the proper procedures for the handling of the computer-based data. The DBA will also facilitate electronic loading, quality control checks of any electronic data, database security and backup, and oversee any manual data entry into EDGE performed in the contractor's office. The DBA or designee will be the central contact and coordinator for the eventual transfer of data to RFEDS. The DBA will report to the Data Manager.

2.4 FIELD DATA COORDINATOR

The Field Data Coordinator is responsible for ensuring that all data management procedures are correctly implemented in the field. Other responsibilities include ensuring that all data and samples are assigned appropriate identification numbers and overseeing manual data entry performed in the field. The Field Data Coordinator will communicate twice weekly with the Data Manager concerning the status of data collection activities and to verify that transmitted data are complete, correct, and accompanied by a transfer form. The Field Data Coordinator or designee will be responsible for completeness of the data package. The Field Data Coordinator will report to the Project Data Manager.

2.5 QA/QC OFFICER

The SVE project quality assurance/quality control (QA/QC) officer will ensure that procedures are carried out in accordance with this DMP. The QA/QC Officer will report to the Project Manager or designee.

3.0 DATA HANDLING SYSTEMS EQUIPMENT, DATA BACKUP, AND SECURITY PROCEDURES

3.1 SVE PILOT UNIT DATA HANDLING AND STORAGE SYSTEMS

SVE Pilot Unit data handling and storage systems consist of the Allen-Bradley programmable logic controller (PLC) 5/20, Allen-Bradley 1784-T47 (1784-T47) programming terminal (386 laptop computer), hermit data loggers, and a 486 personal computer (PC). The PLC 5/20 is the controlling processor for the entire SVE unit. The 1784-T47 will be interfaced with the PLC 5/20 and will run the software that monitors and logs the process variables. The equipment will have the necessary hardware (i.e., memory, coprocessors, etc.) to run the software required for data acquisition. Software anticipated for data acquisition include Microsoft Excel and Allen-Bradley Control View 300. The 1784-T47 will log and temporarily store all electronically collected data. These data will be transferred via 3.5 inch floppy disks to the 486 PC for temporary and backup storage. The 486 PC will also be used to enter manually collected data (i.e., pressure monitor measurements) in accordance with Subsection 5.3.1. All data will be downloaded to floppy disks and transferred to EDGE (described in Subsection 3.2) in accordance with Subsection 5.3.2.

3.2 EDGE DATA HANDLING SYSTEM

The database management system (DBMS) will be designed to generate appropriate reports and tables, provide systematic review and efficient access and retrieval to optimize data use. It is recognized that different types of data (e.g., physical and chemical parameters together with associated location information) from a variety of sources will be collected at various times. To accommodate the various types of information and to allow for easy reporting, retrieval, and site characterization, an appropriate automated database management system will be used.

A DBMS capable of managing all sample data and generating reports, queries, graphs, and exports of the data should be in place prior to the initiation of field activities. EDGE has been developed as a centralized information repository capable of handling all chemical, process, and geological/geotechnical information. Chemical data will be loaded and stored in the EDGE chemical module format, and the physical parameters will be loaded and stored in the EDGE geotechnical module format. EDGE has been designed to take advantage of "Client/Server" architecture. This technology enables a "Server" to control

and distribute data to a large number of "Clients." The Servers for this system are the SCO Unix computers, and the clients are desktop PCs running Microsoft Windows™ and EDGE.

The DBMS will be amenable to reporting of either all or part of the data in selected fields. Furthermore, all or any subset of the data can be selected for review and analysis. EDGE has the capability to export data to numerous personal computer applications, such as Wordperfect, Autocad, Microsoft Excel, Stratigraphics, and Stanford Graphics, and can be transferred in ASCII, Microsoft Excel, or DBASE III-compatible file formats, etc.

3.3 DATABASE BACKUP

3.3.1 Field Data Acquisition Backup and Security Procedures

Data acquired in the field will be directly stored onto disk as raw data (data logger data) or will be entered into EDGE (manually collected data). For the process (e.g., temperatures, pressures, flow rates, etc., in the SVE Unit) data acquired by the Allen-Bradley Data Logger, an additional security will be provided by manually recording a subset of the data, as discussed in Section 5.2.1. A hard copy of the most recent version of the data will be kept with the data disk. The original data will be kept in an orderly manner in the field office. Copies of all data collected for each Pilot Test, both disk and hard copy, will be sent to the Project Data Manager upon completion of the Pilot Test. The Field Data Coordinator will be responsible for transmittal of the data to the Project Data Manager.

3.3.2 EDGE Backup and Security Procedures

To limit the likelihood of data corruption and maintain the integrity of the database, EDGE incorporates several levels of access privilege. To provide security for the database, the privileges for each of the levels vary. The DBA has access to all of the project data. The Field Data Coordinator is given entry/edit/query access. The individual user access privilege level will be designated by the Project Manager and Data Manager and will be set up for each user by the DBA. General user access for the SVE pilot test database will be to query the chemical and geological modules. This access privilege can vary from loading, editing, and querying to query only depending upon project and personnel needs. The Project Data Manager will have loading, editing, and querying access. Data editing will be performed by the DBA, Data Manager, or their designees. It is also anticipated that once data are loaded little or

no changes to the data are expected. Any modifications to the data must receive the authorization of the Project Data Manager. Changes to the data will be documented as described in Section 5.

It is the responsibility of the DBA to backup the EDGE database in the Contractor's office daily onto tape. This level of backup is considered to be sufficient for the SVE pilot study database as the raw data will be maintained in disk format in both the field office and at the contractor office. The Field Data Coordinator is responsible for backing up the field EDGE database daily to disk or tape.

4.0 DOCUMENTATION

The following are considered key elements in properly documenting and tracking data.

4.1 DATA ACQUISITION DOCUMENTATION

It is necessary to record detailed information so that the data acquisition can be reconstructed. The Scientific Notebook System (SNS) (DOE 1993b) is one of the primary mechanisms for data acquisition. Data that are collected using non-standard procedures will be collected in accordance with the SNS and documented in the scientific notebook. Data for the SVE pilot study will be compiled from a number of different sources. As a minimum, the scientific notebook, electronically collected data records, and sample collection forms should include the following information for each data or sample point:

1. Field sample identification (ID)
2. Date and time of sampling/measurement
3. Sample measurement location
4. Sample measurement description
5. Sample depth (if appropriate)
6. Parameters or analyses being reported
7. Associated quality control (QC) samples (e.g., duplicates, matrix spikes, etc.)

4.2 TRANSMITTAL OF FIELD DATA TO PROJECT DATA MANAGER

A transfer form will be used to document the transport and receipt of any data from the field to the Data Manager or designee. A sample transfer form is shown in Figure 4-1. For data management purposes, the data information needed on the transfer form includes:

1. SVE Pilot Test Number
2. Data type being shipped (e.g., process parameters, etc.)
3. Collection date and time for sample(s) or date and time period for electronically logged data.
4. Disk Identifier
5. File Name(s)

FIGURE 4-1
DATA PACKAGE TRANSFER FORM

1. Transfer Date: _____ Page ____ of ____

2. Data Information

Disk Identifier	File Name	Pilot Test Number	Collection Date/Time or Date/Time Period	Hardcopy Included (Y/N)[1]	Data Type(s)[2]	Relevant Forms Included (Y/N)[3]	Comments

[1] If no, please comment

[2] M Manually collected physical parameters
D Process parameters from the Allen-Bradley or other data logger
A Sample Collection Information

[3] Data Management QC Check Form
Data Backup/Measurement Form
Copies of Manual Measurement Collection Forms

Transferred By: _____
(Print Name) (Signature) (Date)

Subcontractor: _____

Accepted By: _____
(Print Name) (Signature) (Date)

Subcontractor: _____

Following shipment of data from the field to the Data Manager or designee, the Field Data Coordinator will confirm that the data have been received.

4.3 DATA RECEIPT CONFIRMATION

Upon receipt of the data package, the Data Manager is responsible for checking the transfer form(s) to verify that:

1. All data listed were received.
2. The data received matches the data acquisition plans.
3. The appropriate field QC checks were performed (Data Management QC Forms).

The Data Manager will have the responsibility of ensuring that discrepancies identified during the checking process will be corrected and documented as detailed in Section 5.3.3.

4.4 NOMENCLATURE USED IN THE SVE PILOT TEST

Since the SVE pilot test will be acquiring data of different types from a number of different sources, the nomenclature used for sample data points is critical to the storing of data in the database. Furthermore, the user must be able to query data from the database in a clear and efficient manner. Therefore, in order to avoid confusion, the end-user will need to be familiar with the nomenclature that is pertinent to each of the various data acquisition activities. This familiarity is needed to facilitate constructing a database query to provide the complete dataset that is required and reduce the possibility of omission. During the course of the pilot test, a systematic nomenclature for the SVE Pilot Test will be completed and a master reference list will be included in the scientific notebook.

Process data will be identified by instrument [as listed on the Process and Instrumentation Diagram (P&ID)], time collected, and pilot test number. Manually collected data will be identified by well location, time collected, and pilot test number. This information is further detailed in Section 5.2.

Samples for chemical analysis will be assigned Rocky Flats Environmental Database System (RFEDS) identification including sample number and location. The RFEDS soil, soil gas, and groundwater sample numbers may not directly translate to the SVE nomenclature used in the computer database management

system. Therefore, prior to loading RFEDS data into EDGE, where appropriate SVE nomenclature will be added to the database to facilitate accurate and efficient data retrieval. The amount of SVE nomenclature added will be minimized and RFEDS nomenclature will be used when possible. EDGE stores the appropriate RFEDS sample and location identifiers along with the SVE location identifiers.

5.0 DATA MANAGEMENT - DATA TRACKING, DATA ENTRY, AND DATA PROOFING

5.1 OVERALL PROCEDURES

5.1.1 General Overview

The principal means of tracking the data collection will be by use of the form "Data Backup/ Measurement." An example is included as Figure 5-1. There is a unique form for each of the tests. The forms will be used to monitor that the sample measurements are recorded appropriately and also serve as backup for the Allen-Bradley Data Logger electronic data. In addition, the Data Backup/Measurement form will be used by the Data Manager to check electronic loading of the Allen-Bradley Data Logger data.

The Data Manager will be responsible for reviewing the field data generated for this project to ensure that the data are complete and correct. Nonconformances will be assessed by the Data Manager. If the identified nonconformances impact the overall project, the problems will be brought to the attention of the Project Manager to evaluate the appropriate actions.

5.1.2 Project Synchronization

All data acquisition for the SVE pilot study will be recorded in military time and date. The Allen-Bradley data logger uses an electronic clock. The time reported by the data logger will be the official time for the tests during the project. Data associated activities (e.g., collection of the gas samples for analysis and manual collection of physical parameters from the wells) will be referenced to the data logger time. Field crews will synchronize clocks to the data logger at the beginning of each shift.

5.1.3 Data Tracking and Compilation

Each of the SVE pilot tests has a pre-determined configuration that dictates the data requirements. The requisite data collection is summarized on the Data Backup/Measurement forms. The data originating from RFEDS (i.e., groundwater, soil gas, and soil sample analysis) will require different tracking and QC procedures that are described in Section 5.2.4. The Field Data Coordinator or designee will be responsible for monitoring the data collection. Problems that are identified will be immediately reported to the Project Manager or designee. Such problems may have a direct impact on meeting the objectives of the test in progress. Changes or modifications to the program requirements will be made on the Data Backup/ Measurement form so that an accurate summary of the configuration and data collection will be

FIGURE 5-1
DATA BACKUP/MEASUREMENT FORM FOR SVE PILOT TEST NO. 1

1. PILOT START TIME :_____ PILOT START DATE:_____
2. MEASUREMENT TIME :_____ (4 hour increments from Start Time)
3. PILOT END TIME :_____ PILOT END DATE:_____
4. MEASUREMENTS

	Measurement (Every 4 hours)						
	P	Q	T	RH	Rad(1)	OVD	HC
Location							
AV1	M	D				M	A
Dilution Air Line	D	D	D	D			
Vapor Manifold	D		D	D			
B-300 Out	D		D	D		M	A
GAC-1 Out	D					M	A
GAC-2 Out	D					M	A
Stack	D	D	D		M	M	

1 - Initial if SAAM and pump are operational
A - Initial if Summa canister soil gas sample has been collected
D - Write actual value as read from the PLC graphic interface panel
M - Initial if data have been collected

P - Pressure (units per PLC panel)
Q - Flow rate (SCFM)
T - Temperature (°F)
RH - Relative Humidity (%)
Rad - Radiation monitoring
OVD - Organic Vapor Detector
HC - Soil Gas sample

5. COMPLETED BY:_____
(Print Name) (Signature) (Date)

6. SUBCONTRACTOR:_____

7. "D"-DATA CHECKED AGAINST ELECTRONIC DATA LOGGER DATA

CHECKED BY:_____
(Print Name) (Signature) (Date)

8. VERIFIED THAT THE DATA REQUIRED FOR SECTION 3 ARE LOADED IN EDGE FOR THE TIME NOTED IN 2.

VERIFIED BY:_____
(Print Name) (Signature) (Date)

maintained. These changes will also be documented in the scientific notebook.

Copies of these Data Backup/Measurement forms will accompany data that are sent to the Data Manager as part of the data package. Upon receipt, the Data Manager will check the field copy of the Data Backup/Measurement form against the plan version. The Data Manager will verify changes with the Project Manager.

The Data Management QC check form, Figure 5-2, will be used to track the data from collection to use. These forms serve to monitor that QC procedures are completed at each stage of data handling prior to initiating the next stage. Problems identified at each stage can be investigated and corrected, thus limiting the possibility of errors becoming embedded in the database. These forms also help prevent release or use of unverified data.

The data will be loaded into EDGE and the entry checked by the DBA or designee as described in Section 5.3.2. Upon completion of the data loading, the DBA or Data Manager will update the Data Management QC Form to indicate that the data loading and entry into the database have been completed and the entries checked.

A scientist and/or engineer assigned by the Project Manager will perform a technical review in accordance with Standard Operating Procedures (SOP) FO.14, Section 5.4 (EG&G 1992). If possible, this review will be performed prior to data transmittal to the Data Manager. Otherwise, the review will be performed after the data are loaded in EDGE. The QC check form will be initialed by the reviewer. If the data are inconsistent, the Project Manager will be notified.

5.2 COLLECTION ACTIVITY-SPECIFIC DATA MANAGEMENT

5.2.1 Allen-Bradley Logger and Hermit Data Logger Data

Data will be transmitted in an ASCII format. The ASCII file will then be preprocessed in a dBase program to produce an EDGE format (data exchange file). The following section summarizes the sequence of events and procedures for collecting, checking, and storing data logger data.

FIGURE 5-2
DATA MANAGEMENT QC CHECK FORM - DATA LOGGER

SUMMARY OF DATABASE QC STEPS FOR TEST # _____ **PROJECT/TASK** _____

Disk Identifier	File Name	Data Collection Period (Military Time)	Field QC	Receipt of Data Initial QC	Load into EDGE	EDGE QC	Data Correction Changes Checked	Database Integrity Confirmed	Scientific Data Review Complete

Note: For the cells above, indicate the date and initial after each action or task is completed.

Figure 5-3 summarizes the data flow for the data logger data from collection through data reporting. Figure 5-2 parallels this data flow and is an example of the Data Management QC Check Form for the Allen-Bradley and Hermit Data Logger's data. This form will be used to verify that the data have been properly processed.

The majority of the pilot study data will be collected using an Allen-Bradley data logger. Data recorded by the data logger will be from SVE pilot unit instruments and the two groundwater extraction wells. Data will be recorded from the measurement points listed in Table 5-1 at a frequency of once every 10 minutes.

The Hermit data logger will record water level draw-down in wells 24993, 25093, 12191, 24193 (SV1) for the pilot tests that required water table depression. Measurement frequency will be determined during the pilot tests. After completion of the water table depression pilot tests, the hermit data logger data will be downloaded electronically to the 486 PC and a hard copy will be printed. This data will be included with the data package discussed later in this section.

Instrument measurements will also be recorded manually every 4 hours from the PLC graphic interface panel onto the Data Backup/Measurement form specific to the pilot test (Figure 5-1 is the form for Pilot Test No. 1, similar forms will be used for the other pilot tests). These readings are backup data to the electronically logged data in the event that data logging was unsuccessful or electronic data were lost. After each pilot test run, the data will be exported from Control View 300. If necessary, changes will be made to the data and the disk contents will then be copied onto the 486 PC and a hardcopy of the data will be printed. As a QC check, the data on the Data Backup/Measurement form will be compared with the corresponding electronic data by the Field Data Coordinator or designee. The datalogged values should be comparable to the manually recorded values. Small discrepancies (5 to 10 percent) may exist due to fluctuation of the instrument readings. If large discrepancies exist, the Project Engineer will be contacted for a course of action. The "Field QC" column of the QC Check form will be initialed and dated by the Field Data Coordinator or designee performing the field QC.

Once the electronic data have been field checked, the data files will be uploaded onto labeled 3.5-inch floppy disks. A data package will be assembled consisting of the disk(s), hard copy printout of data, Data Management QC Check forms, and Data Backup/Measurement forms. A transfer form will be filled out and the data package will be delivered to the Data Manager in accordance with Subsection 4.2. The Data

FIGURE 5-3
DATA LOGGER DATA MANAGEMENT SYSTEM FLOWCHART

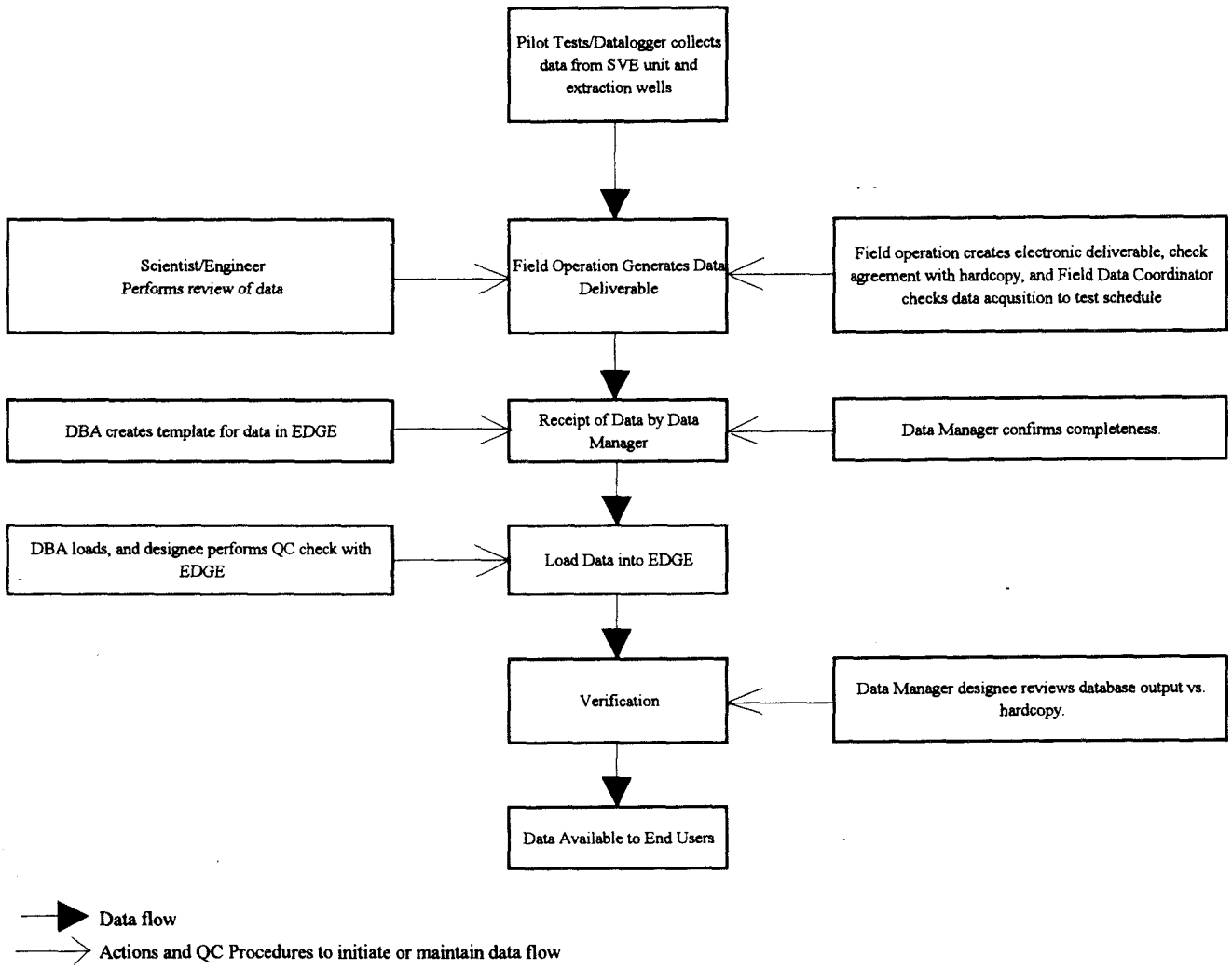


TABLE 5-1

INSTRUMENT POINTS
ON THE SOIL VAPOR EXTRACTION UNIT

1. Dilution Air
   - PI-100-Pressure (in Hg)
   - MI-100-Relative Humidity (%)
   - TI-100-Temperature (°F)
   - FI-100-Air Flow Rate (SCFM)
   - FQ-100-Total Air Flow (SCF x 1000)

2. Soil Gas (SG) (Vapor Manifold)
   - PI-110-Pressure (in Hg)
   - MI-110-Relative Humidity (%)
   - TI-110-Temperature (°F)
   - FI-110-SG Flow Rate (SCFM)
   - FQ-110-Total SG Flow (SCF x 1000)

3. HEPA Filter
   - PI-200-HEPA Inlet Pressure (knockout drum outlet) (in Hg)
   - PI-201-HEPA Outlet Pressure (B-300 Blower inlet) (in Hg)
   - MI-200-HEPA Outlet Relative Humidity (%)
   - TI-200-HEPA Inlet Temperature (°F)

4. GAC Units
   - PI-400-GAC 1 Outlet Pressure (in Hg)
   - PI-410-GAC 2 Outlet Pressure (in Hg)
   - TI-400 A through C GAC 1 Temperature Profile
   - TI-410 A through C GAC 2 Temperature Profile

5. Stack
   - PI-500-Stack Pressure (in Hg)
   - TI-500-Stack Temperature (°F)
   - FI-500-Treated Soil Gas Flow Rate Through Stack (SCFM)
   - FQ-500-Total Soil Gas Flow Through Stack (SCF x 1000)

TABLE 5-1

(Continued)

6. Miscellaneous

PI-300 Blower-B-300 Outlet Pressure (in Hg)
MT-300 Blower-B-300 Outlet Temperature (°F)
MI-300 Blower-B-300 Relative Humidity (%)
PI-600 Blower-B-600 (injection air) discharge pressure (in Hg)
TI-600 Blower-B-600 discharge temperature (°F)
FID Measurement prior to makeup air (ppm v/v)
PI-SI1 Sandstone injection well pressure (psig)
PI-SV1 Sandstone extraction well pressure (psig)
LEV-SI1 Water level from grade for sandstone injection well (ft)
LEV-SV1 Water level from grade for sandstone extraction well (ft)

Manager will review the transfer form and the data package for completeness in comparison to the plan. If complete, the electronic data will be loaded into EDGE by the DBA. Otherwise, minor corrections will be made prior to loading into EDGE and documented as described in Section 5.3.3. More significant problems that may impact the project will be brought to the attention of the Project Manager for a decision on the appropriate corrective or preventative actions, and the data will not be loaded into EDGE until the problem has been resolved.

The Data Manager or designee will check a minimum of ten percent of the electronic data loaded into EDGE to verify that the steps documented as complete were performed and that the data reported in the database are correct and complete. The database will then be reviewed in accordance with Section 5.3.2 and verified in accordance with Subsection 5.4.1. If any changes are made subsequent to loading the data into EDGE, the changes will be made in accordance with Section 5.3.3. Data used or reported prior to verification will be marked "PRELIMINARY."

5.2.2 Manually Collected Field Data

Data collected manually consist of pressure measurements at the pressure monitors and extraction and injection wells, and OVD measurements at various points on the SVE unit. The data required are dependent upon the specific pilot test. The test-specific Data Backup/Measurement form will list the measurements. The measurement frequency is generally every four hours. However at the beginning of some tests, pressure measurements will be required every 10 minutes until steady state is achieved. These requirements are detailed in the Implementation and Operation Plan (EG&G 1994).

Figure 5-4 summarizes the data flow for the manually recorded data from collection through data reporting. Figure 5-5 is an example of the Data Management QC Check form for the manually recorded data and corresponds to the data flow. This form will be used to verify that the data have been properly processed.

Physical parameters measured manually will be recorded on forms. The field forms for remote pressure and OVD measurements are shown as Figures 5-6 and 5-7, respectively. The results will be entered into EDGE in the field. The data entry will be QC reviewed in accordance with Subsection 5.3.1. The QC Check Form will be initialed by the reviewer. The data will be exported on a test by test basis to a 3.5 inch floppy disk.

FIGURE 5-4
MANUAL DATA COLLECTION SYSTEM FLOWCHART

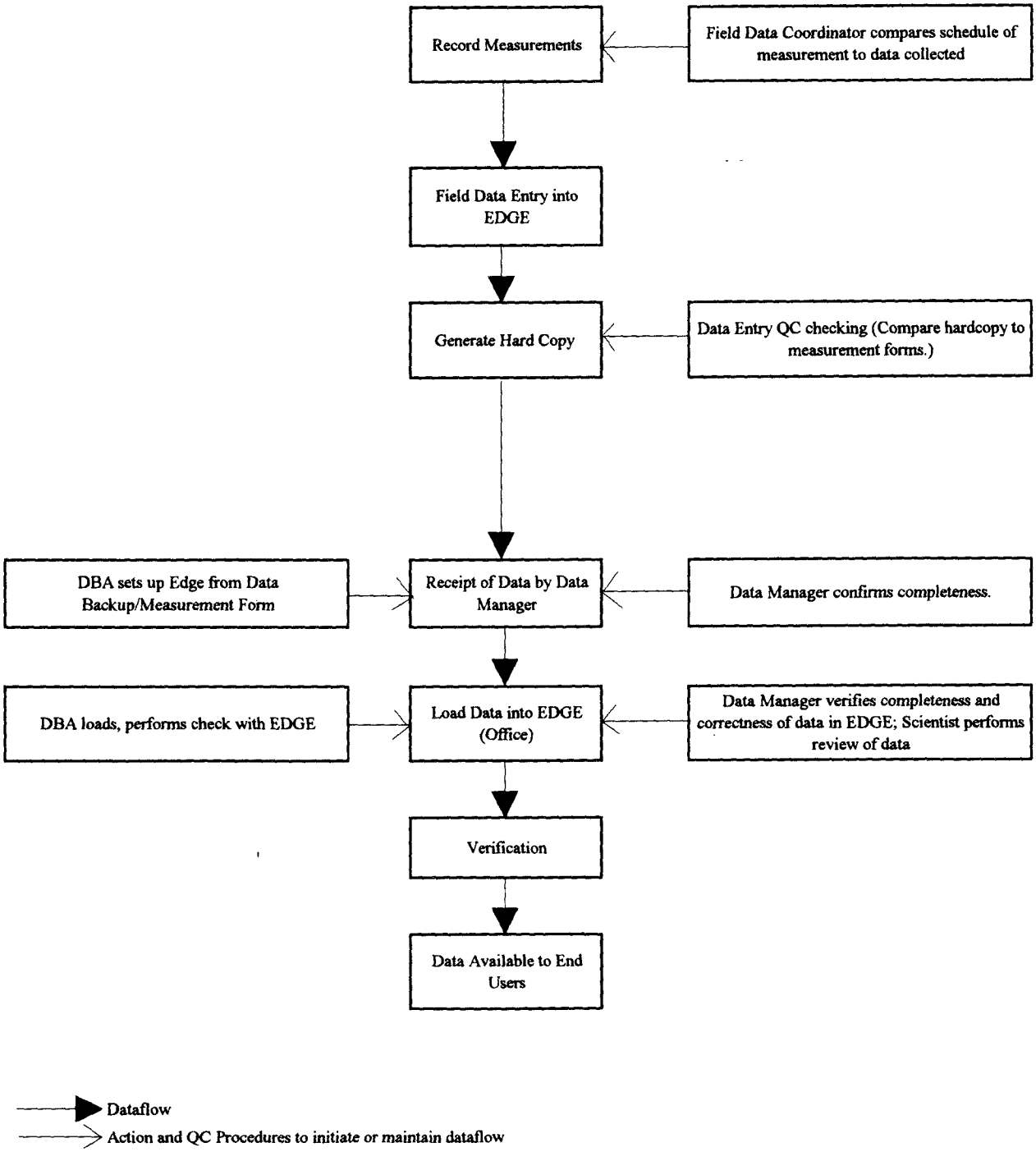


FIGURE 5-5
DATA MANAGEMENT QC CHECK FORM - MANUALLY COLLECTED PHYSICAL PARAMETERS

SUMMARY OF DATABASE QC STEPS FOR TEST #_____ DATA COLLECTION TIME PERIOD _____

Data Entry	Field QC	Data Export	Receipt of Data Initial QC	Load COC into EDGE	Load RFEDS Analytical into EDGE	EDGE QC	Data Correction Changes Checked	Database Integrity Confirmed	Scientific Data Verification Complete

FIGURE 5-6
OU2 SVE PILOT TEST
REMOTE PRESSURE MEASUREMENT FORM

1. Pilot Test Number _____ Page ___ of ___
   Monitoring Location: _____
   Date: _____

2. Equipment Information and Background Measurements

Manufacturer and Model No.	Serial Number	Calibration Date	Background Reading	Units

3. Pressure Measurements

Initials	Time (military)	Steady State (Y/N)	Pressure Reading (in. water)	% Change[1]	AV1 Pitot Tube Reading[2] (in. water)	SV1 Pitot Tube Reading[2] (in. water)

[1] At startup, subsurface pressure readings will be collected every 10 minutes until four consecutive readings are within 20% (steady state). After steady state has been reached, subsurface pressure will be measured every 4 hours (DOE, 1993a).

[2] Pitot tube readings will be taken only when soil gas is being extracted from both AV1 and SV1 (IOP, 9/93).

Checked By: _____
(Print Name) (Signature) (Date)

Subcontractor: _____

FIGURE 5-7
OVD Measurement Form

1. Monitoring Location: _____ Pilot Test Number _____
Date: _____

2. Equipment Information and Background Measurements

Manufacturer and Model No.	Serial Number	Calibration Date	Background Reading	Units (e,g., PPM)

3. OVM Measurements

Sampler Initials	Time (military)	OVD Reading[1] (ppm)

[1] At startup, if the the stack readings increase 10 ppm over background, an initial soil gas sample will be collected from the stack (DOE, 1993a).

Checked By: _____
Print Name Signature
Subcontractor: _____

Once the data have been field checked, a data package will be assembled. The data package will consist of disks, hard copy printouts, collection forms, Data Management QC Check forms, and Data Backup/Measurement forms. A transfer form will be filled out and the data package will be transferred to the Data Manager. Upon receipt, the Data Manager or his designee will review the data package for completeness in comparison to plan. If complete, the electronic data will be loaded into EDGE by the DBA. The database will then be reviewed in accordance with Section 5.3.2 and verified in accordance with Subsection 5.4.1. If any changes are made subsequent to loading of the data into EDGE, the changes will be made in accordance with Section 5.3.3. Data used or reported prior to verification will be marked "PRELIMINARY."

5.2.3 Soil Gas Sample Data

Extracted soil gas samples will be collected in SUMMA canisters every four hours and analyzed for the four primary VOCs of interest: carbon tetrachloride, chloroform, trichloroethylene, and tetrachloroethylene. The samples will be collected at take-off points on the SVE Pilot Unit and at the extraction well sample ports. The field form for soil gas sample collection is shown on Figure 5-8. An extended analyte list, comprised 37 VOCs, will be required at the frequency summarized in Section 3.7 of the Implementation and Operation Plan (EG&G 1994). The complete list of volatile compounds to be analyzed and reported are shown in Table 5-2.

Sample identification, test number, date, collection time, matrix, and sample location will be entered into a Microsoft Excel spreadsheet or into Edge in the field and also copied onto a 3.5-inch floppy disk(s). A Data Management QC Check Form (Figure 5-5) will be completed to reflect the QC measures. The information will be entered following the procedures described in Section 5.3.1. A data package will be compiled consisting of electronic and hard copy of the spreadsheet or EDGE export, Data Management QC check form, and sample collection forms. A transfer form will be filled out and the package will be transferred to the Data Manager. The Data Manager will review the package for completeness. The spreadsheet or Edge export will then be reviewed in accordance with Section 5.3.2 and verified in accordance with Subsection 5.4.1. Any changes will be made in accordance with Section 5.3.3. The spreadsheet or Edge export will be used to identify the soil gas data when it is received from RFEDS.

FIGURE 5-8

SOIL GAS SAMPLE COLLECTION FORM

Project Number: _____ Test Number: _____

Sample Number: _____ Type: _____

Sample Location: _____

Collection Date: _____

Collection Time: _____ Purpose: _____

Composite (Y/N): _____

Sample OC Type: _____ Partner: _____

Collection Method (Circle One): Grab Integrated

Sample Team Leader: _____

Sample Team Member: _____

Sample Team Member: _____

Initial Value (in. Hg): _____ Final Pressure (psig) _____

Analysis Required: TO-14 Preservative: No Prsv

Checked By: _____
(Print Name) (Signature) (Date)

Subcontractor: _____

TABLE 5-2

TARGET ANALYTE LIST FOR SOIL GAS

1. **Primary Analytes**

Carbon Tetrachloride
Chloroform
Trichloroethylene
Tetrachloroethylene

2. **Complete List of Analytes** - Soil gas samples will be analyzed for these analytes in accordance with Section 3.7 of the Implementation and Operation Plan (DOE 1994)

Dichloroethane
Chloromethane
Bromomethane
Vinyl chloride
Methylene chloride
Acetone
Carbon disulfide
1,1-Dichlorethylene
1,1-Dichlorethane
trans-1,2-Dichloroethylene
cis-1,2-Dichloroethylene
*Chloroform
1,2-Dichloroethane
2-Butanone
1,1,1-Trichloroethane
*Carbon tetrachloride
Vinyl acetate
Bromodichloromethane
1,1,2,2-Tetrachloroethane
1,2-Dichloropropane
cis-1,2-Dichloropropene
trans-1,2-dichloropropene
*Trichloroethylene
Dibromochloromethane
1,1,2-Trichloroethane
Benzene
Bromoform
2-Hexanone
4-Methyl-2-Pentanone
*Tetrachloroethylene
Toluene
Chlorobenzene
Ethylbenzene
Styrene
o-Xylene
m-Xylene
p-Xylene

*Primary analytes

5.2.4 RFEDS Analytical Data

Figure 5-9 summarizes the data flow for the RFEDS data. This includes soil, groundwater, and extracted soil gas analytical data. Table 5-3 lists the samples collected during the well installation.

Analytical data will be obtained from RFEDS in electronic format. An example of the RFEDS electronic format is shown in Table 5-4. The data will be checked for format correctness and completeness. The RFEDS analytical data will be pre-processed by a dBase program to create an EDGE (WC Format) readable format. The appropriate nomenclature link will be added to the chemical data to allow an end user to easily query the data from the database. Upon completion of loading, the Data Manager will review the data for completeness in comparison to plan. The database will then be reviewed in accordance with Section 5.3.2 and verified in accordance with Subsection 5.4.1. The QC Form in Figure 5-5 will document the loading and QC for this step. If any changes are made subsequent to loading of the data into EDGE, the changes will be made in accordance with Section 5.3.3. Data used or reported prior to verification will be marked "PRELIMINARY."

5.3 DATA ENTRY

Data can be entered in two ways: (1) manual entry from data collection forms and analytical data sheets, and (2) data downloaded into the database from field data disks. All data received from the field will be in an electronic format that is suitable for loading into EDGE.

5.3.1 Manual Data Entry

Data will be entered and stored on disk in the field office. Manual data entry will be followed by a 100 percent data review by a person different than the person who originally entered the data. Errors will be researched and corrected. A hardcopy of the manually entered data will be initialed and dated by the person performing the review. The status of the data will be monitored by the appropriate Data Management QC Check form.

FIGURE 5-9

DATA FLOW FOR SOIL, SOIL GAS, AND GROUNDWATER ANALYTICAL DATA

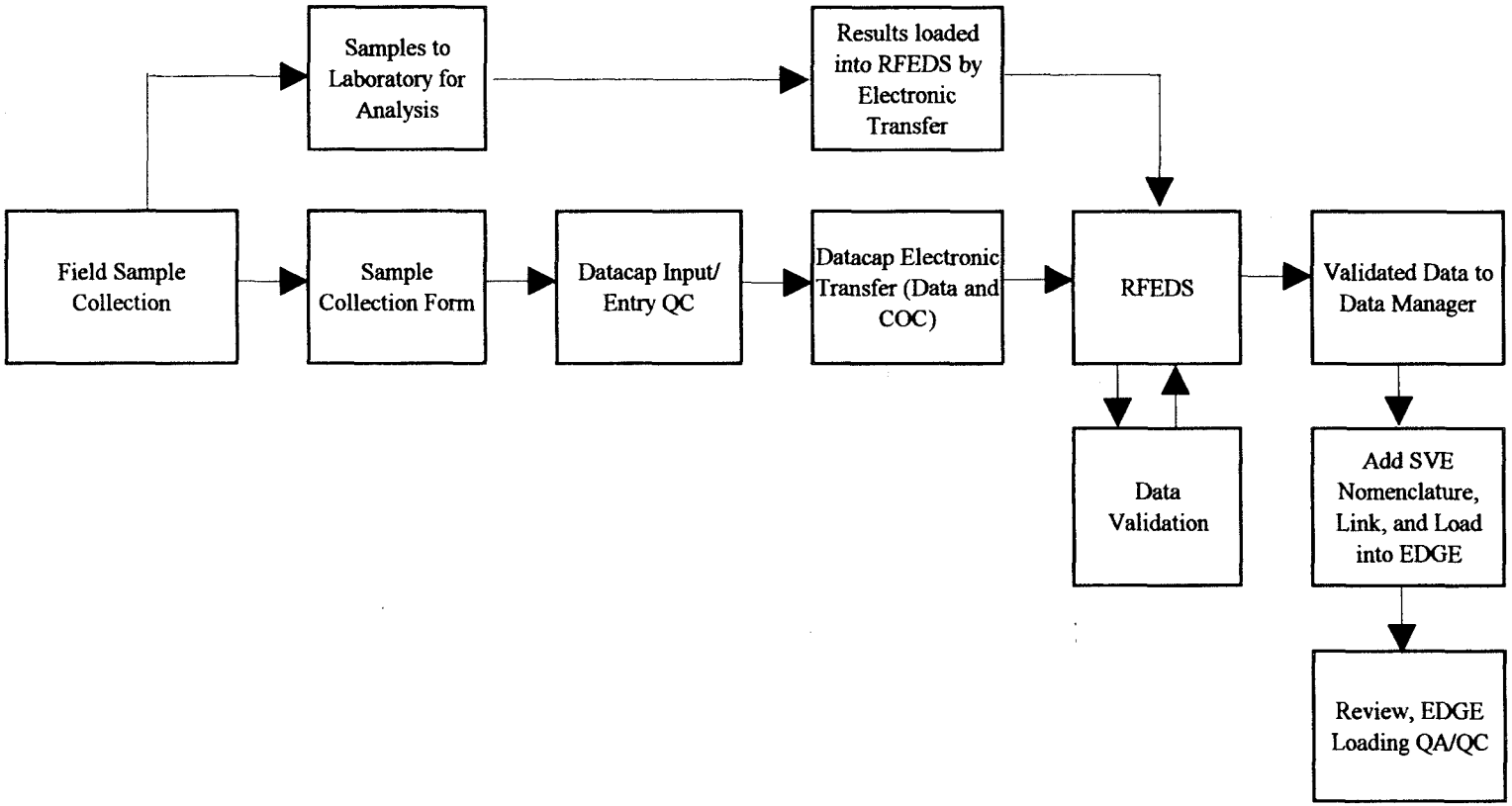


TABLE 5-3
SVE WELL INSTALLATION SAMPLES

SVE LOCATION	RFEDS LOCATION	SAMPLE NUMBER	SAMPLE DEPTH (ft)	SAMPLE TYPE	ANALYSIS REQUESTED
Abandoned	24793	BH20600WC	7.7-8.0	1	VOA, Cn, CLP Metals, Dissolved CLP Metals
Abandoned	24793	BH20601WC	7.7-8.0	1	VOA, Cn, CLP Metals, Dissolved CLP Metals, pH
Abandoned	24893	BH20602WC	NA	Rinsate	VOA1
Abandoned	24793	BH20603WC	NA	Trip Blank	VOA1
APM1	24493	BH20604WC	7.4-7.7	1	VOA1
APM1	24493	BH20605WC	NA	Rinsate	VOA1
APM1	24493	BH20606WC	NA	Trip Blank	VOA1
APM2	24593	BH20608WC	7.5-7.8	1	VOA1
APM2	24593	BH20609WC	NA	Rinsate	VOA1
APM2	24593	BH20610WC	NA	Trip Blank	VOA1
APM3	24693	BH20607WC	7.5-7.8	1	VOA1
AV1	24093	BH20611WC	1.6-1.8	1	VOA1
AV1	24093	BH20612WC	1.6-1.8	Duplicate	VOA1
AV1	24093	BH20613WC	7.6-7.8	1	VOA1
AV1	24093	BH20614WC	15.1-15.3	1	VOA1
AV1	24093	BH20615WC	0-5	(1) Composite	Rad
AV1	24093	BH20616WC	5-10	(1) Composite	Rad
AV1	24093	BH20617WC	10-15	(1) Composite	Rad
AV1	24093	BH20618WC	NA	Rinsate	Rad and VOA1
AV1	24093	BH20619WC	NA	Rinsate	Rad
AV1	24093	BH20620WC	NA	Trip Blank	VOA1

Notes:

1. Sample Analyses:
   VOA1 = SW846 EPA 8240
   VOA2 = Method 524.2
   Rad = Gross Alpha, Gross Beta, Pu 239/240, Am 241, U 233/234, 235, 238, Sr 89/90, Tritium
2. Sample Types:
   1 - Primary Sample, MS/MSD = Matrix Spike/Matrix Spike Duplicate
3. Samples BH20600WC and BH20601WC were special samples at Site 24793 to analyze nonaqueous phase liquid encountered at the site.
4. All real, duplicate, and MS/MSD samples with a "BH" designation are soil. All real, duplicate, and MS/MSD samples with a "VE" designation are water. All rinsate and trip blank samples are water.

TABLE 5-3
SVE WELL INSTALLATION SAMPLES
(Concluded)

SVE LOCATION	RFEDS LOCATION	SAMPLE NUMBER	SAMPLE DEPTH (ft)	SAMPLE TYPE	ANALYSIS REQUESTED
SPM1	24993	BH20621WC	44.2-44.5	1	VOA1
SPM1	24993	BH20622WC	NA	Rinsate	VOA1
SPM1	24993	BH20623WC	NA	Trip Blank	VOA1
SPM2	25093	BH20634WC	34.6-34.9	1	VOA1
SPM2	25093	BH20635WC	NA	Rinsate	VOA1
SPM2	25093	BH20636WC	NA	Trip Blank	VOA1
SV1	24193	H20624WCMS/MS	7.5-7.8	MS/MSD	VOA1
SV1	24193	BH20625WC	7.5-7.8	1	VOA1
SV1	24193	BH20628WC	NA	Rinsate	VOA1
SV1	24193	BH20629WC	0-5	(1) Composite	Rad
SV1	24193	BH20630WC	5-10	(1) Composite	Rad
SV1	24193	BH20631WC	10-15	(1) Composite	Rad
SV1	24193	BH20632WC	NA	Rinsate	Rad
SV1	24193	BH20633WC	NA	Trip Blank	VOA1
SV1	24193	BH20626WC	35.6-35.9	1	VOA1
SV1	24193	BH20627WC	65.6-65.9	1	VOA1
SV1	24193	BH20637WC	NA	Rinsate	VOA1
SV1	24193	BH20638WC	NA	Trip Blank	VOA1
SV1	24193	VE20001WC	NA	1	Metasl, Rad, VOA1,and VOA2
SV1	24193	VE20002WC	NA	Duplicate	Metasl, Rad, VOA1,and VOA2
SV1	24193	VE20003WC	NA	Rinsate	Metasl, Rad, VOA1,and VOA2
SV1	24193	VE20004WC	NA	Trip Blank	VOA1
SI1	24393	VE20005WC	NA	1	Metasl, Rad, VOA1,and VOA2
SI1	24393	VE20005WCMS/MS	NA	MS/MSD	Metasl, Rad, VOA1,and VOA2
NOT USED YET		VE20006WC			NA
SI1	24393	VE20007WC	NA	Rinsate	Metasl, Rad, VOA1,and VOA2
SI1	24393	VE20008WC	NA	Trip Blank	VOA

Notes:

1. Sample Analyses:
   VOA1 = SW846 EPA 8240
   VOA2 = Method 524.2
   Rad = Gross Alpha, Gross Beta, Pu 239/240, Am 241, U 233/234, 235, 238, Sr 89/90, Tritium
2. Sample Types:
   1 - Primary Sample, MS/MSD = Matrix Spike/Matrix Spike Duplicate
3. Samples BH20600WC and BH20601WC were special samples at Site 24793 to analyze nonaqueous phase liquid encountered at the site.
4. All real, duplicate, and MS/MSD samples with a "BH" designation are soil. All real, duplicate, and MS/MSD samples with a "VE" designation are water. All rinsate and trip blank samples are water.

TABLE 5-4
EXAMPLE OF RFEDS BASIC ANALYTICAL DATA EXTRACTION FORMAT DESCRIPTION

The output file from a standard data extraction is ASCII format, column delimited with spaces used to fill out column width. An additional space has been added between columns for legibility.

The requested data extraction has the following column format:

	FIELD	STARTING POSITION	FIELD LENGTH
A	Location	1	15
B	Sample Number	17	20
C	Project Name	38	15
D	Sample Type	54	2
E	Sample QC Code	57	4
F	Sample QC Partner	62	20
G	Sample Date	83	9
H	Laboratory	93	5
I	Lab Batch ID	99	15
J	Analysis Date	115	9
K	Test Group Code	125	10
L	Result Type	136	3
M	Chemical	140	40
N	Parameter Code	181	11
O	Run Number	193	3
P	County Number	197	3
Q	Lab QA Code	201	4
R	Lab Sample Number	206	10
S	Result Qualifier	217	1
T	Result	219	10
U	Unit Measure	230	10

TABLE 5-4
(concluded)

	FIELD	STARTING POSITION	FIELD LENGTH
V	Error	241	10
W	Qualifier	252	5
X	Detect Limit	258	10
Y	Validation	269	2
Z	Reason 1	272	3
AA	Reason 2	276	3
AB	Reason 3	280	3
AC	Reason 4	284	3
AD	VResult	288	10
AE	VUnit	299	10
AF	VQual	310	5
AG	VDetect	316	10
AH	Validation Date	327	9
AI	Sequence Id (RFEDS ID)	337	10

5.3.2 Electronic Data Loading into EDGE

When a data file is loaded into EDGE, a review of the entered data will be performed by the DBA designee for systematic errors related to loading. If errors are found, the reason for the errors will be investigated by the Data Manager and the Project Manager and appropriate corrective action will be taken.

5.3.3 Corrections and Changes to Sample Data

It is expected that changes or corrections may be required to the data stored in EDGE. In the instances where changes are required to the database prior to the final QC review, all changes must be accompanied by a Data Correction/Change form (Figure 5-10). The form will detail the changes to be made and document that the changes were completed. Corrections to the database will be proofed by the Data Manager or designee for potential entry errors.

The data may require changes after the final QC review. All changes will be accompanied by a Data Correction/Change Form (Figure 5-10) and performed in accordance with the above procedures. The Data Manager is responsible for tracking all data users. Changes will be issued to all affected users.

5.4 DATA VERIFICATION

Problems encountered in data management are typically due to inconsistencies or errors in the data reporting. Ten percent of the data in the database will be verified by comparing a printed hard copy from the database to field forms using the procedures in SOP FO.14, Section 5.6 (EG&G, 1992). Typical errors that are found include, but are not limited to, the following:

1. Incorrect field sample numbers
2. Duplicate data and samples
3. Improper parameter names
4. Samples with missing data
5. Missing samples
6. Incorrect sample collection data
7. Incorrect units
8. Incorrect qualifiers

FIGURE 5-10

DATA CORRECTION/CHANGE FORM

The following changes and/or corrections to the database are required (check all that apply):

_____ Data qualifiers have been assigned to the attached sample data

_____ The following sample analyses have been cancelled:

_____ Other changes or corrections (describe below):

Changes Requested By _____
(Print Name) (Signature) (Date)

Changes Made By _____
(Print Name) (Signature) (Date)

Changes Checked By _____
(Print Name) (Signature) (Date)

9. Missing detection limits, as applicable
10. Incorrect number of significant figures reported
11. Incorrect recording of times
12. Inconsistencies in the sequences of data collection

It is important that data inconsistencies and errors be identified as soon as possible to allow for correction prior to data use.

To track the number of data points, samples, and analyses requested, it is important that all data (whether they are physical, chemical, or geotechnical parameters) be recorded and checked to verify that the data collected meet the project requirements.

5.4.1 Final QC Review

The following data final QC review procedures are applicable to all data acquisition for the SVE pilot study. The procedures are designed to ensure that the final database is complete and correct.

1. Complete database QC review on a per-test basis. A hard copy of the database, organized by test, will be checked by the Data Manager or designee against requirements in the Implementation and Operation Plan (DOE 1994a).

2. Clearly mark corrections to the hard copy database report in red ink.

3. Using the data entry sheets and sample collection sheets, check that the data identifications are correctly listed on the database hard copy, and that the number of data points or number of samples for the test are reported on the database hard copy.

4. Check that all the parameters requested for each test are reported on the database hard copy.

5. Check that the units reported on the database hard copy are correctly reported.

6. Check that data time sequences are correct.

7. Check values for all manually collected parameters reported from the database against the field collection form (e.g., Figure 5-6), at a frequency of approximately 10 percent of the data for each test. If errors are found, an additional 10 percent of results will be checked for similar errors. If errors are found in the second 10 percent, all results will be checked.

8. For each test, note any questions concerning the data reporting and check with the Task Manager or Project Manager before returning the reviewed and edited database hard copy to the Data Manager.

9. Keep a copy of the edited hard copy database.

10. Check the corrected copy of the database to determine that corrections have been completed (i.e., verify the final hard copy of the database).

11. The data will then be reviewed by a scientist familiar with the project objectives and data collection activity for data that do not make scientific sense (i.e., a concentration value of 2,000,000 mg/kg).

12. Changes required as a result of the review will be performed in accordance with Section 5.3.3.

13. Following completion of the QC procedure, the Project Manager, in consultation with the Project QA/QC Officer and Data Manager, will change the database reporting status to "FINAL."

14. After completing the QC check off from the first pilot test data set, discuss the general findings of the review procedure with the Data Manager and the Project Manager. Depending upon the review findings, appropriate modifications to the review procedure may be proposed on a Document Modification Request.

6.0 REFERENCES

EG&G. EMD Operating Procedures, Volume I: Field Operations, Revision 2. March 1992.

U.S. DOE. 1993. OU-2 IM/IRA Scientific Notebook Plan, Soil Vapor Extraction Pilot Test. December.

U.S. Department of Energy (DOE). 1994. OU-2 IM/IRA Implementation and Operation Plan, Soil Vapor Extraction Pilot Test. March 1994.